Papers and Originals

Hypnosis for Asthma—a Controlled Trial

A Report to the Research Committee of the British Tuberculosis Association*

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Summary: An investigation of hypnosis in asthma was made among patients aged 10 to 60 years with paroxysmal attacks of wheezing or tight chest capable of relief by bronchodilators. One group of patients was given hypnosis monthly and used autohypnosis daily for one year. Comparisons were made with a control group prescribed a specially devised set of breathing exercises aimed at progressive relaxation. Treatment was randomly allocated and patients were treated by physicians in nine centres. Results were assessed by daily diary recordings of wheezing and the use of bronchodilators, and by monthly recordings of $F.E.V._1$ and vital capacity. At the end of the year independent clinical assessments were made by physicians unaware of the patients' treatment.

There were 252 patients (127 hypnosis and 125 controls) accepted for analysis, but a number of them did not continue the prescribed treatment for the whole year: 28 hypnosis and 22 control patients failed to co-operate, left the district, or had family problems; one hypnosis and one control patient died. Seven hypnosis and 17 control patients were withdrawn as treatment failures, the difference between the two groups being statistically significant.

As judged by analyses based on the daily "score" of wheezing recorded in patients' diaries, by the number of times bronchodilators were used, and by independent clinical assessors, both treatment groups showed some improvement. Among men the assessments of wheezing score and use of bronchodilators showed similar improvement in the two treatment groups; among women, however, those treated by hypnosis showed improvement similar to that observed in the men, but those given breathing exercises made much less progress, the difference between the two treatment groups reaching statistical significance. Changes in $F.E.V._1$ and V.C. between the control and hypnosis groups were closely similar.

Independent clinical assessors considered the asthma to be "much better" in 59% of the hypnosis group and in 43% of the control group, the difference being significant. There was little difference between the sexes. Physicians with previous experience of hypnosis obtained significantly better results than did those without such experience.

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Those participating in the field-work were: Drs. Crocket, Davies, Kalinowski, Macdonald, Maher-Loughnan, McAllen, Morrison Smith, Brian Shaw, and Stewart.

The investigation was co-ordinated by Dr. G. P. Maher-Loughnan at Colindale Hospital, London. The collection of monthly records was made by Miss B. J. Kinsley, who, together with Dr. I. Sutherland, analysed the results.

The report was prepared by Dr. G. P. Maher-Loughnan and Miss B. J. Kinsley.

Introduction

Hypnosis has been used to treat many illnesses but has been subjected to little controlled study. Morrison Smith and Burns (1960), in reporting the results of the first controlled trial of hypnosis to be published, found no improvement in asthmatic children one month after hypnotic suggestion. On the other hand, Maher-Loughnan, Macdonald, Mason and Fry (1962), in another controlled trial over a longer period, showed that hypnosis with daily autohypnosis gave greater relief subjectively than an antispasmodic used alone.

The aims of the present study were to evaluate the effects of hypnosis and autohypnosis in asthma by means of a controlled study. Response to treatment was assessed by measurements of respiratory function in addition to patients' diary recordings of symptoms, and independent clinical assessments by physicians who were unaware of the patients' treatment. The study was planned by a subcommittee of the Research Committee of the British Tuberculosis Association.

Method of Investigation

Selection

Physicians from nine chest clinics referred patients for the trial. Patients of either sex aged 10 to 60 years who had had paroxysmal attacks of wheezing or tight chest capable of relief by bronchodilators were accepted. The asthma had to be either "moderate"—that is, "at least two attacks during the preceding 12 months severe enough to have justified seeking the help of a doctor," or "persistent asthma controlled by regular antispasmodics," or "severe"—that is, attacks of status asthmaticus or loss of at least three months' working time or a hospital admission for asthma within the preceding 12 months. They had to be likely to co-operate and to remain in the district for one year.

The following patients were not acceptable: those with "mild" or only seasonal asthma; those who had received corticosteroids; those who had chronic bronchitis for over three years or who produced perennially more than 1 oz. (28 g.) of sputum daily; those who were judged to have bronchiectasis, emphysema, or pulmonary fibrosis as seen on a chest radiograph; and those with a history of epilepsy or psychosis.

Treatment

Patients were allocated to treatment by either hypnosis or autohypnosis (the hypnosis group) or by bodily relaxation and special breathing exercises (the control group), from a list based on random sampling numbers.

Initial assessments were made during an observation period of four weeks (described as a "month" throughout the paper), after which the physician in charge was notified of the treatment allocation. Treatment was prescribed for one year, during

which the patients were seen by the physician monthly. The same physician in each centre was responsible throughout the trial for the treatment of all the patients in both groups; for short periods only, as for sickness or leave, an adequately trained deputy took over.

The two treatments were:

(1) *Hypnosis and Autohypnosis.*—An eye-thumb-fixation method was used at induction, which generally produced eye closure within two minutes. Suggestions were then given that, by daily autohypnosis, a state of easing of tension would occur in the patient, and as a result of this his breathing would become and remain free. At the second visit a week later autohypnosis was taught by transference under hypnosis: the suggestion was given that by autohypnosis each day the patient would experience the same benefit as with hypnosis. At each subsequent visit the patient was given reinforcing suggestion under hypnosis.

(2) *Relaxation and Breathing Exercises.*—A method of relaxation of the body was taught, followed by two of a set of 12 newly designed breathing exercises, which aimed at progressively relaxed respiration. An illustrated booklet of instructions was issued to each patient allocated to the control group. The bodily relaxation method was used throughout the trial; of the two breathing exercises, a new one was substituted each month.

Treatment was to be carried out for 15 minutes daily, preferably in the evening, throughout the 12 months.

Additional Treatment.—The patients were allowed to continue using bronchodilators, but were asked to record the number of times they were used; antibiotics were given for respiratory infections. However, treatment with corticosteroids, hypnosis (for those allocated to the control group), or desensitization were to be avoided so far as possible during the course of the trial.

Assessments During Treatment

(1) Daily recordings were made by the patients on a printed card of the amount of wheezing, and the number of times a bronchodilator was used. In recording the amount of wheezing each day the patient marked one of the following four categories: absence of wheeze for 24 hours (later arbitrarily assigned a score of 0), occasional wheezes (score 1), wheezing for two hours or more (score 2), attack of asthma (score 3). The daily figures were added for each four-week period to provide monthly total scores. (2) Monthly recordings of forced expiratory volume in one second ($F.E.V._1$) and vital capacity (V.C.) were made. (3) At the end of the year independent clinical assessments were made by a physician unaware of the patient's treatment.

Intake of Patients and Method of Analysis

Patients were submitted between October 1962 and November 1964 from nine centres. Twenty-five (14 hypnosis and 11 control) were excluded from analysis because they did not conform to the requirements of the protocol. There remained 127 hypnosis and 125 control patients for analysis.

A number of patients did not continue the prescribed treatment and were withdrawn during the course of the trial, either because of the introduction of corticosteroids or for other reasons; details are given later. During the first three months 16 patients (7 hypnosis and 9 control) were withdrawn.

Three months was regarded as a suitable minimum period for an effect of treatment to be observed; therefore the progress (during the year of treatment) only of those who completed at least three months in the trial has been analysed, and only for the time during which the prescribed treatment was continued. There were thus 120 hypnosis and 116 control patients for this analysis. However, for a full evaluation of the two treatments at the end of the year, those patients who were withdrawn during the first three months will be considered.

Observations Before Treatment

Of the patients who continued with the prescribed treatment for at least three months 36% were aged 10 to 19 years and 18% were between 40 and 59 years; the age and sex distributions in the two treatment groups were closely similar. There were some differences between the two groups in the various assessments of the asthma made initially; there were more patients in the hypnosis group with the "extrinsic" type of asthma than in the control group, more with "severe" asthma, and more with a length of history of 15 years or over.

Results During Treatment

Applicability of Prescribed Treatment

One month after the start of the allocated treatment an assessment was made of the depth of trance achieved in the patients given hypnosis. Almost all the patients (97%) were satisfactorily hypnotized and in seven of them (6%) a "deep" trance (spontaneous amnesia) was obtained; in four "failure" was reported, but a trance was later achieved in three of them. All except 11 patients achieved autohypnosis without difficulty, but 7 of the 11 did achieve this later.[1]

In the control group an assessment was made of the ability to do the prescribed exercises; this was reported as "good" in 96 patients (83%) and as "indifferent" in 18 (16%). In the remaining two patients the ability was assessed as "bad."

Considering the degree of co-operation obtained from all the patients after one month's treatment, this was "good" in 111 (92%) of the hypnosis group and in 99 (85%) of the control group. "Bad" co-operation was not reported in any hypnosis patient, but the co-operation of four control patients was "bad." In spite of difficulties encountered by some patients in each group, all of them have been retained in the analysis of the results.

Changes in Wheezing

The progress of the asthma during the period of prescribed treatment, as reflected by the average scores for wheezing, is shown in Table I. Patients in whom prescribed treatment was altered after the first three months ("treatment failures") and the one control patient who died are shown separately in the Table. Since the distribution of scores showed a large proportion of patients having low or moderate values and a small proportion of patients having high values, the calculations were made on the logarithms of the scores, leading to the geometric means shown in the Table.

In the hypnosis group the average score for wheezing was reduced during the year by two-thirds, from 24.0 in the observation month to 7.8 at 52 weeks. In the control group the average monthly score was decreased by one-half, from 20.1 to 10.1; the difference between the two groups at 52 weeks is not statistically significant. However, the sexes appear to have behaved differently. Among females the mean score in the hypnosis group was significantly lower than that of the control group from 28 weeks onwards (except at 36 weeks),

[1] A short course of hypnosis was given to all but six of the control patients when they had completed a year in the trial. The majority (91% of the 79 patients assessed) were satisfactorily hypnotized and in five of them (6%) a "deep" trance was obtained; "failure" was reported in seven patients. The two groups were thus similar in the extent of their ability to be hypnotized, though it should be remembered that the assessment in the control group was made a year later and therefore the groups are not strictly comparable; nor does it include those patients who were withdrawn.

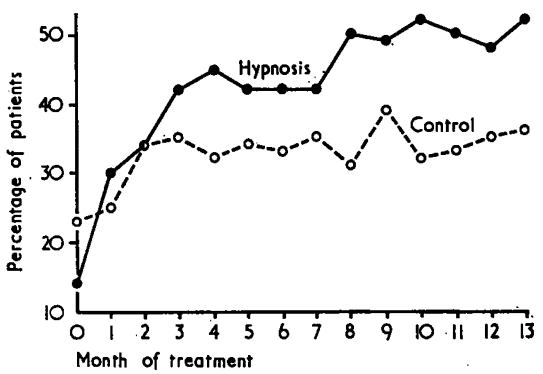
TABLE I.—*Geometric Mean Scores for Wheezing during Prescribed Treatment*

Weeks after Start of Treatment	Total				Males				Females			
	Hypnosis		Control		Hypnosis		Control		Hypnosis		Control	
	No. Observed	Mean Score	No. Observed	Mean Score	No. Observed	Mean Score	No. Observed	Mean Score	No. Observed	Mean Score	No. Observed	Mean Score
Pretreatment	120	24·0	116	20·1	57	24·3	60	19·7	63	23·7	56	20·5
4	120	18·6	115	18·8	57	17·5	59	15·6	63	19·7	56	22·9
16	117	12·0	106	14·9	54	12·5	55	13·3	63	11·5	51	17·0
28	101	10·5	101	13·8	48	12·0	52	12·0	53	9·3*	49	16·0
40	96	9·7	93	13·2	47	12·3	48	12·1	49	7·7*	45	14·4
52	91	7·8	86	10·1	45	9·7	47	7·5	46	6·3*	39	14·2
No. withdrawn as treatment failures	6	—	15	—	1	—	4†	—	5	—	11	—

* The difference in the geometric mean scores for females between the hypnosis and control groups attains significance at the 5% level.
† Including one death.

whereas none of the corresponding differences for males attained statistical significance.

The changing proportions of patients who had no wheezing or a "score" of less than 15 in each four-week period throughout the year are shown in the Chart. The advantage to the hypnosis group after the first two months is evident, and the differences between the two groups are significant at the 5% level at 8, 10, 11, and 13 months. The average number of days per month on which the patient was free of wheezing has not been tabulated, but it rose from 7 to 15 days during the year in the hypnosis group and from 8 to 12 in the control group; the difference between the two groups is not, however, statistically significant.



Proportion of patients with wheezing "score" less than 15.

Use of Bronchodilators

The average number of times bronchodilators were used is shown in Table II. Again the geometric mean scores have been calculated.

The average number of times a bronchodilator was used diminished more in the hypnosis group than in the control group during the year. By the end of the year the hypnosis group were using bronchodilators on average 17.0 times (geometric mean) and the control patients 27.7 times per month. The difference between the two groups at 52 weeks does not quite reach statistical significance, but the corresponding difference at 48 weeks was significant at the 5% level.

Once more there was a difference in the experience of males and females: the females in the hypnosis group used bronchodilators to a significantly less extent than those in the control group from 12 weeks onwards, but among the males there were no corresponding differences between the two groups.

Respiratory Function Tests

There was considerable variation in the recordings of $F.E.V._1$ and V.C. from month to month for each patient and also between patients. The arithmetic mean values of the $F.E.V._1$ are shown in Table III. The two groups were closely similar throughout the year, nor were there any differences between the two sexes. Analyses of the ratio $F.E.V._1/V.C.$ were also

TABLE II.—*Geometric Mean Frequency of Use of Bronchodilators during Prescribed Treatment*

Weeks after Start of Treatment	Total				Males				Females			
	Hypnosis		Control		Hypnosis		Control		Hypnosis		Control	
	No. Observed	Mean Frequency	No. Observed	Mean Frequency	No. Observed	Mean Frequency	No. Observed	Mean Frequency	No. Observed	Mean Frequency	No. Observed	Mean Frequency
Pretreatment	120	54·7	115	52·8	57	57·5	60	46·2	63	52·2	55	61·0
4	120	45·4	112	48·6	57	53·8	58	38·4	63	38·9	54	62·6
16	115	27·1	105	40·2	53	31·7	55	33·3	62	23·7*	50	49·4
28	102	24·9	101	32·0	48	31·3	52	24·5	54	20·3*	49	42·4
40	97	21·6	93	28·6	47	34·3	48	26·0	50	13·8*	45	31·7
52	90	17·0	82	27·7	44	24·2	44	23·8	46	12·1*	38	33·0

* The difference in the geometric mean frequencies for females between the hypnosis and control groups attains significance at the 5% level.

TABLE III.—*Arithmetic Mean Forced Expiratory Volume (1 sec.) during Prescribed Treatment*

Weeks after Start of Treatment	Total				Males				Females			
	Hypnosis		Control		Hypnosis		Control		Hypnosis		Control	
	No. Observed	Mean $F.E.V._1$	No. Observed	Mean $F.E.V._1$	No. Observed	Mean $F.E.V._1$	No. Observed	Mean $F.E.V._1$	No. Observed	Mean $F.E.V._1$	No. Observed	Mean $F.E.V._1$
Pretreatment	118	1·8	116	1·8	56	2·0	60	2·1	62	1·7	56	1·5
4	117	1·8	112	1·8	55	2·1	57	2·1	62	1·6	55	1·6
16	115	1·9	107	1·9	53	2·1	57	2·1	62	1·8	50	1·6
28	95	2·0	90	1·8	46	2·1	46	2·0	49	1·8	44	1·6
40	90	1·9	85	2·0	43	2·1	44	2·1	47	1·8	41	1·8
52	87	2·0	81	2·1	43	2·2	44	2·3	44	1·9	37	1·9

None of the differences in the mean $F.E.V._1$ between the hypnosis and control groups attains statistical significance.

TABLE IV.—*Mean Trends in Wheezing Score, Use of Bronchodilators, and Forced Expiratory Volume during Prescribed Treatment Expressed as Percentage Changes*

Average Percentage Change During Year of Treatment	Total		Males		Females	
	Hypnosis (109 Patients)	Control (106 Patients)	Hypnosis (51 Patients)	Control (54 Patients)	Hypnosis (58 Patients)	Control (52 Patients)
Percentage decrease in wheezing score ..	52·1***	31·2***	46·6***	38·8**	56·5***	22·1*
Percentage decrease in frequency of use of bronchodilators	59·6***	37·0***	54·3***	46·3**	63·9***	25·5
Percentage increase in F.E.V.$_1$	4·3*	0·3	3·7	−2·5	4·8	2·9

*, **, *** Trends significantly different from zero at the 5, 1, and 0·1% levels respectively.
Of the differences in the trend between the hypnosis and control groups, only the differences for wheezing in females, and in both sexes together, are significant at the 1 and 5% levels respectively.

made, but the results were again closely similar in the two groups and have not been tabulated.

Average Trends During the Year

The trends in the wheezing score, the use of bronchodilators, and the F.E.V.$_1$ have been studied comprehensively, and the results are shown in Table IV. Because the absolute changes in these measures were greater in the early months than later in the year, the calculations were performed on the logarithms of the values. The trends in the values were then expressed in terms of the percentage change for the whole period of the trial. Only those patients who were observed on at least five occasions during the year have been included in this analysis.

All the downward trends in the score for wheezing during the year for the two groups, males and females separately, were significantly different from zero, and (except for the females in the control group) so also were the downward trends in frequency of use of bronchodilators. The changes in F.E.V.$_1$ were very much smaller, and only in the hypnosis group (both sexes together) was there any significant difference from zero.

Comparison between the two treatment groups shows that the downward trends in wheezing score and the use of bronchodilators, and the upward trend in F.E.V.$_1$, were all greater in the hypnosis group than in the control group. However, only the difference between the groups in the reduction of wheezing score (52.1% for the hypnosis group and 31.2% for the control group) attains significance at the 5% level. This difference between the groups is reflected in the females (56.5% compared with 22.1%) and is significant at the 1% level; the corresponding difference among males is not significant.

Independent Clinical Assessments

Independent clinical assessments were made in each centre at the end of the year. Only those assessments that were made within six weeks of the date due have been included. Every effort was made to keep the independent assessors unaware of the treatment received, and this was in fact discovered with only four hypnosis and nine control patients.

At the end of the year of treatment the asthma was assessed as "much better" in 59% of the hypnosis group and in 43% of the control group; in addition 8 and 17% respectively were considered "worse" or had changed treatment. One control patient had died. The difference between the two groups is significant at the 5% level.

The percentages assessed as "much better" were closely similar for males and for females within each treatment group.

Patients Withdrawn from Analysis

As already mentioned, a number of patients were withdrawn during the course of the trial. They were included in the analysis only for the period during which the prescribed treatment was maintained without interruption. There were differences between the two groups in the reasons for withdrawal.

Failures of Treatment.—Patients in whom the prescribed treatment was altered are regarded as treatment failures. There were seven treatment failures (6%) among the 127 hypnosis patients, and 17 (14%) among the 125 control patients; the difference is significant at the 5% level. The hypnosis patients were given corticosteroids: in four of them the change was initiated by the participating physician. Of the control patients 15 were given corticosteroids and two were given hypnosis. In seven of the patients the change was initiated by the participating physician.

Deaths.—There were two deaths during the year: one hypnosis patient was a woman of 54 years, assessed as having moderate intrinsic perennial asthma, who died suddenly from status asthmaticus after one month of treatment in the trial; the other, a control patient, was a man aged 22 assessed as having moderate extrinsic asthma, perennial and seasonal (in October and November), who also died suddenly from asthma in May, after six months of treatment in the trial.

Others Withdrawn.—In addition to the patients in whom treatment had failed, seven hypnosis and 10 control patients themselves discontinued treatment; the asthma had improved in four hypnosis patients, three of whom did not feel the need to continue and one who refused to continue with hypnosis though would accept other treatment; one control patient considered the exercises "a waste of time," as they had not done him any good. No reason was supplied by the remaining three hypnosis and nine control patients. Thirteen hypnosis and eight control patients were not able to continue in the trial because of personal or family difficulties, and a further seven hypnosis and four control patients because they left the vicinity of the clinic, and one hypnosis patient was given pollen vaccine.

With regard to the patients withdrawn in both groups, there was considerable variation in the proportion withdrawn in each of the nine centres, which ranged from 10 to 48%; there was, however, no single reason accounting for the difference between the centres. The numbers were small in each centre, but occurred similarly throughout the year.

Progress According to Initial Assessments

Progress of the asthma within each treatment group was analysed according to the various assessments made before the start of treatment. These included age, age at onset, length of history, type (intrinsic or extrinsic), and severity; there were no significant differences between the categories of each assessment.

There was a marked difference in the results between those patients treated by physicians who had previously had experience in the use of hypnosis and those treated by physicians who had not had any previous experience. In the hypnosis group 67% of 49 patients treated by physicians with previous experience compared with 49% of 43 patients treated by physicians without previous experience were "much better," according to the independent clinical assessments; none and 16% respectively were "worse" or "treatment failures." The difference between the results of physicians with previous experi-

ence and those of physicians without previous experience is significant at the 5% level. By contrast, in the control group there was no significant difference.

Discussion

This controlled trial set out to explore the value of hypnosis and autohypnosis in the treatment of asthma. One group was treated with hypnosis and autohypnosis, and comparisons were made with a control group taught to use bodily relaxation, followed by specially devised breathing exercises which aimed at relaxation of muscles of respiration.

As judged by the results from the daily "score" of wheezing recorded in patients' diaries, by the number of times bronchodilators were used, and by independent clinical assessors, there was improvement in the asthma for each sex in both treatment groups. This improvement may have been due, in part, to spontaneous improvement in the asthma during the year, to the unspecific effect of increased medical attention and interest provided in the trial, and also to the withdrawal of severely ill patients who received corticosteroid or other treatment and so did not contribute to the assessments. There were seven such patients in the hypnosis group and 17 control patients, the difference between the two groups being statistically significant; these withdrawals could have produced a slight bias in favour of the patients remaining in the control group.

Among the male patients the assessments of wheezing score and use of bronchodilators showed similar improvement in the two treatment groups. Among the females, however, those treated by hypnosis showed improvement similar to that observed in the males, but those given relaxation and breathing exercises made much less progress, the difference between the two treatments reaching statistical significance.

Several interpretations of these differences may be considered: firstly, that the natural course of asthma is more favourable in man than in woman, but we are unaware of any evidence that this is, in fact, so; secondly, that breathing exercises had a deleterious effect in women, while hypnosis in both sexes, and breathing exercises in men, exerted no such effect; this seems so unlikely that the hypothesis can be dismissed; and thirdly, that hypnosis had a favourable therapeutic effect in both men and women, and breathing exercises a similar advantageous effect in men only.

There seems to be no satisfactory explanation of why the females showed so little response to the breathing exercises, though it has been suggested that men acquire more readily than women the techniques of special breathing styles and relaxation. In spite of this difficulty in explaining the different responses of the two sexes to breathing exercises, it is reasonable to suppose that hypnosis and autohypnosis exerted a favourable effect, as judged by the patients' own recordings and those of the independent clinical assessments.

In the only other long-term controlled trial of similar but smaller numbers of patients, where a different control was employed (Maher-Loughnan *et al.*, 1962), patients treated by hypnosis and autohypnosis showed significantly greater improvement than those in the control group. In contrast to the present trial, however, both sexes when hypnotized improved as compared with the controls, who were merely given a new bronchodilator and no significant degree of improvement appeared in either sex. Morrison Smith and Burns (1960) did not find any improvement in a group of asthmatic children, but there were only two hypnotic treatments, autohypnosis was not employed, and the assessment period was only one month.

There was little change in $F.E.V._1$ and no significant differences emerged between the two groups. However, it was recognized that monthly tests might be inadequate as an objective measure of asthma in some instances, as a single isolated recording would not always reflect a patient's real respiratory condition during the month. Such problems as the assessment of a patient with severe episodic nocturnal wheezing who might fail to show abnormal readings when tested at midday could not be solved. A patient who recorded some clear days and some days of wheezing would produce different results, as judged by the one measurement supposedly representing the whole month, if seen on a "clear" day than on a "wheezing" day; another patient, late for an appointment, might inhale isoprenaline to facilitate the rush and omit to mention it. It was recognized that there would be considerable variations from month to month for each patient and from patient to patient, but it was administratively impossible to undertake more frequent recordings on outpatients in a trial of this nature.

There were many difficulties in running the investigation. Nine physicians participated in the work; four of these had had previous experience of hypnotherapy and five learnt the technique just before the trial period started. The results showed that physicians with previous experience of hypnosis had a significantly higher proportion of patients who improved according to the independent clinical assessments. Those with previous experience of the hypnotic technique found that the rigid framework of the trial was very restrictive, as patients were seen only at set intervals and only direct suggestion under hypnosis, supplemented with autohypnosis, was employed; more flexible and deeper methods of hypnotherapy were not permitted. Moore (1965) found that one of the more advanced techniques of hypnotherapy, using reciprocal inhibition, produced a significantly greater improvement in respiratory function than simple relaxation under hypnosis.

Most centres had difficulty in maintaining the co-operation of their patients, especially those allocated to breathing exercises, for such a long time. The period of prescribed treatment was a year, and patients were asked to continue the diaries for a further year; this undoubtedly taxed the interest and patience of many, who had to be encouraged actively to continue, especially those who showed no improvement.

There were considerable differences in the progress of the asthma, according to the various initial assessments of the type, severity, length of history, age, and so on, which effect improvement. Because of the overlapping and intermingling of these innumerable factors, and because the numbers of patients in any subclassification were very small, it is difficult to interpret their contribution to the final outcome. However, taking each assessment separately, many interesting results emerge. For example, the small number of patients with intrinsic asthma progressed similarly to those whose asthma was extrinsic. There were also no marked differences in progress of patients treated with hypnosis, according to the type of trigger for their asthma. Though a psychological method of treatment was used, those whose asthma was triggered by emotion, among other factors, did not differ from the others in their response to the hypnosis.

It is hard to separate "psychological" triggers from the others, since in the Pavlovian sense most, including allergic triggers, have some element of "conditioning" attached to them. The view that a daily autohypnotic regimen replaces old habits by new conditioning would explain the uniformity of responses to treatment of the asthma, whatever the trigger.

Although when planning the trial it was recognized that assessment of personality would be of value, it was not practicable to introduce them into an already overcrowded schedule of appointments.

In conclusion, the hypnotic method used in this trial has been shown, under controlled conditions, to be of greater value in treating female patients suffering from asthma than was relaxation supplemented by the newly designed breathing exercises. The patients are being followed for a year, to assess whether the benefit of treatment is maintained and to watch for the reappearance of symptoms or other conditions which might arise after treatment.

The British Tuberculosis Association is grateful to the many people who have co-operated in this investigation. A list of the

nine centres is given below, with the names of the participating physicians in parentheses, together with (1) the independent clinical assessors, and (2) the administrative, nursing, and technical staff who took a major part in running the trial during its four years. The breathing exercises were specially devised for the trial by Dr. P. J. D. Heaf and Dr. G. P. Maher-Loughnan in the Chest Department at University College Hospital, London. The illustrations in the booklet containing details of the breathing exercises were drawn by Miss C. Schmolle. The criteria used for classifying the type of asthma were recommended by Dr. J. Pepys, who made the final decision in cases of doubt. The secretarial work was undertaken by Mrs. D. Williams, who also painstakingly transcribed the monthly diary recordings and helped with the analysis of results.

Chest Clinic, Knightswood Hospital, Glasgow (Dr. J. A. Crocket): (1) Dr. C. D. Anderson, Dr. C. Johnston ; (2) Sister MacLeod, Staff Nurse Mitchell, Dr. J. F. Boyd, Staff Nurse McRae, Mrs. Corrigan.
Ransom Hospital, Mansfield (Dr. D. Davies): (1) Dr. W. H. R. Smith ; (2) Miss B. Buck.
Worcester Royal Infirmary (Dr. S. Z. Kalinowski): (1) Dr. E. N. Moyes ; (2) Mrs. M. J. Rowlands, Sister A. Hartley, Sister R. James, Mr. G. H. Green.
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Osteoporosis of Lumbar Vertebrae and Calcification of Abdominal Aorta in Women Living in Durban

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Summary : To try to establish whether mechanical stress and muscular activity in earlier life influence the incidence and severity of spinal osteoporosis in old age lateral x-ray films of the lumbar vertebrae were obtained from three matched groups, each of 100 women 50 to 90 years old. Group A was of rural Bantu accustomed to carrying heavy loads on their heads. Group B was of urban Bantu, mainly in domestic service. Group C was of women of European origin.

Severe osteoporosis occurred in three cases from group A, two from group B, and 14 from group C. Lesser degrees of osteoporosis could not be assessed precisely enough for inclusion in these figures. Evenly biconcave vertebral bodies, strongly suggestive of osteomalacia, were seen in 10 from group A, five from group B, and one from group C. In many Bantu subjects the fifth lumbar vertebra appeared flattened though of good radiodensity and with no marked changes in the other vertebrae. Twenty-eight of these were from group A, 16 from group B, and none from group C.

About a third of each group showed severe degenerative changes in the spine ; another third showed milder changes. More cases of spondylolisthesis occurred in the Bantu groups than in the white group. Severe calcification in the abdominal aorta was noted in 24 women in group C. Mild signs occurred in 35 further women from group C, in six from group B, and in only one from group A.

Introduction

Osteoporosis is seen most commonly in old age, and by some it is regarded as an integral part of the normal ageing process (reviewed by Rose, 1967). Other factors, especially hormonal, are known to play a significant part in the development of osteoporosis. However, prolonged immobilization, as after paralysis or after fracture, can also produce severe osteoporosis of the affected part. No clear evidence exists about the part that might be played by lesser degrees of immobilization or of minor changes of activity over very long periods, nor is it clear how far the reverse may be true—namely, the possibly beneficial effect of great activity on new bone formation.

In the work described here an attempt has been made to establish whether the incidence and severity of osteoporosis of the spine appearing in old age is influenced in any way by mechanical stress and muscular activity during earlier life. To do this we chose to examine the lumbar vertebrae of matched groups of women, 50 to 90 years old, from two different races in Durban, South Africa, where there are excellent medical facilities for this purpose. Many differences exist between the ways of life of Bantu and of white women in and around Durban, but one of the most striking concerns the amount of mechanical stress to which their spines are subjected during childhood, young adulthood, and middle age. It is the practice of rural Bantu women to carry loads of all kinds on their heads. Such loads, usually of firewood or buckets full of water, may approach 2 cwt. (100 kg.) and they are often carried for distances of several miles. They begin to carry loads in this way from about 8 years of age, so the effect, if any, of weight-bearing covers an important period of skeletal maturation and growth. As the study proceeded we also decided to record some other features shown on the *x*-ray films.

Nordin (1966) studied the incidence of osteoporosis in about 1,000 normal male and female adults of various ages in 10 different countries. That study was intended particularly to note the effects of diet and of age. We are unaware of any study which is concerned only with the possible effect of exercise and which has used a more narrowly demarcated human population.

Case Material

The groups were made up as follows:

Group A : 100 Bantu women who had spent their entire lives in rural areas working on the farms and who often carried heavy loads on their heads.

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